Cambridge Assessment International Education

# Cambridge IGCSE™

**CHEMISTRY** **0620/11**

Paper 1 Multiple Choice (Core) **May/June 2024**

**45 minutes**

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

**INSTRUCTIONS**

- There are **forty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

**INFORMATION**

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.



06_0620_11_2024_1.17a
© UCLES 2024

**[Turn over**

**1** The boiling point of sodium is 890 °C.

What happens to sodium atoms as the temperature of a sample of sodium changes from 950 °C to 900 °C?

**A** The atoms move more quickly and bonds are formed.

**B** The atoms move more quickly and bonds are neither broken nor formed.

**C** The atoms move more slowly and bonds are formed.

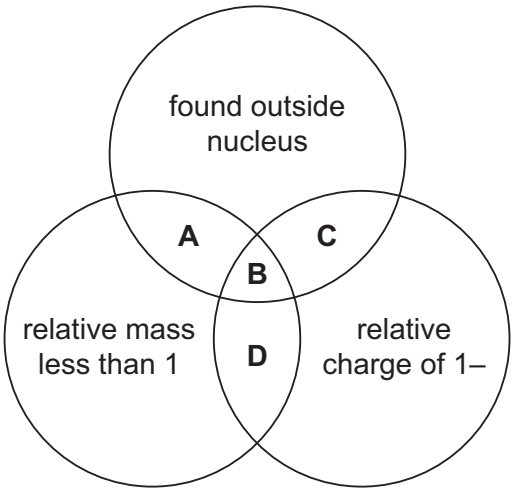
**D** The atoms move more slowly and bonds are neither broken nor formed.

**2** Which row shows the conditions for the particles of a gas colliding most frequently?

| | pressure | temperature |
|---|---|---|
| **A** | high | high |
| **B** | high | low |
| **C** | low | high |
| **D** | low | low |

**3** The diagram shows some properties of particles in an atom.

To which labelled part of the diagram do electrons belong?




© UCLES 2024

**4** Some properties of substances W, X, Y and Z are shown.

| | melting point / °C | electrical conductivity |
|---|---|---|
| W | 801 | conducts when molten |
| X | –182 | does not conduct |
| Y | 840 | conducts when solid |
| Z | 501 | conducts when molten |

Which substances are ionic?

**A** W, X and Y **B** W and Y only **C** W and Z **D** X and Z

**5** Atoms lose or gain electrons to become ions.

Which row is correct?

| | change to the atom | type of ion | charge on ion |
|---|---|---|---|
| **A** | loss of two electrons | cation | 2– |
| **B** | loss of one electron | anion | 1– |
| **C** | gain of three electrons | anion | 3– |
| **D** | gain of one electron | cation | 1– |

**6** A covalent molecule, M, contains four shared pairs of electrons.

What is M?

**A** ammonia, $NH_3$

**B** hydrogen chloride, $HCl$

**C** methane, $CH_4$

**D** water, $H_2O$

**7** Which substance has a giant covalent structure?

**A** sodium chloride

**B** sodium

**C** ethane

**D** diamond

© UCLES 2024

**8** Iron(III) oxide is reduced by carbon monoxide to produce iron and carbon dioxide.

What is the balanced equation for this reaction?

**A** $Fe_2O_3 + 2CO \rightarrow 2Fe + 2CO_2$

**B** $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

**C** $2Fe_2O_3 + 6CO \rightarrow 2Fe + 6CO_2$

**D** $2Fe_2O_3 + 3CO \rightarrow 4Fe + 3CO_2$

**9** The equation for the reaction between magnesium and dilute hydrochloric acid is shown.

$$Mg + 2HCl \rightarrow MgCl_2 + H_2$$

Which mass of magnesium chloride is formed when 48.0 g of magnesium completely reacts with excess dilute hydrochloric acid?

**A** 23.8 g **B** 47.5 g **C** 95.0 g **D** 190 g

**10** Dilute sulfuric acid and lead(II) bromide are electrolysed separately.

Which statements are correct?

1 Colourless gases are produced when dilute sulfuric acid is electrolysed.

2 Lead(II) bromide can be electrolysed when molten.

3 Lead is formed at the positive electrode when lead(II) bromide is electrolysed.

4 Sulfate ions are produced at the negative electrode when dilute sulfuric acid is electrolysed.

**A** 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 3 and 4

**11** Which statements about a hydrogen–oxygen fuel cell are correct?

1 The main form of energy released by the fuel cell is heat.

2 The reaction is a redox reaction.

3 An acidic gas is produced.

4 Water is the only chemical product.

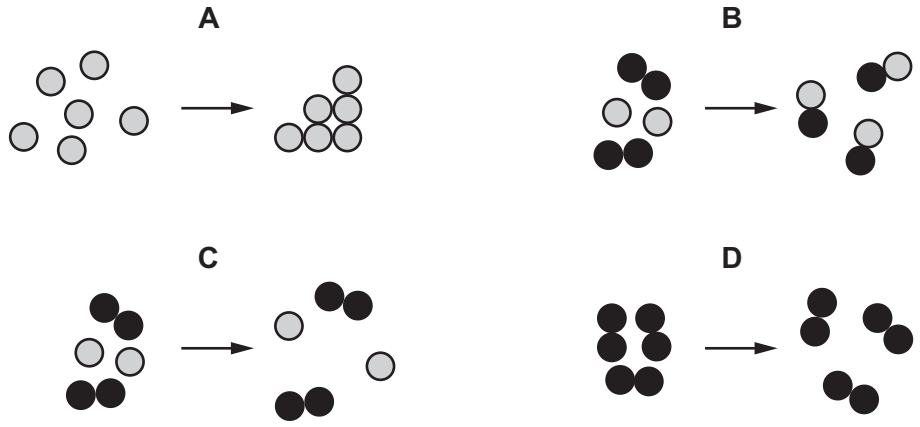
**A** 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

© UCLES 2024

**12** Which row describes what happens during an endothermic reaction?

| | thermal energy is transferred | change in temperature of the reaction mixture |
|---|---|---|
| **A** | from the surroundings | decrease |
| **B** | from the surroundings | increase |
| **C** | to the surroundings | decrease |
| **D** | to the surroundings | increase |

**13** Which diagram represents a chemical change?



**14** A method used to investigate the rate of reaction of calcium carbonate with dilute hydrochloric acid under different conditions is shown.

- Place 50 $cm^3$ of dilute hydrochloric acid in a conical flask.
- Add a known volume of water to the conical flask.
- Heat the conical flask to the required temperature.
- Add 1.0 g of calcium carbonate to the conical flask.
- Measure the time taken for the reaction to finish.

Which volume of water and which temperature give the shortest time taken for the reaction to finish?

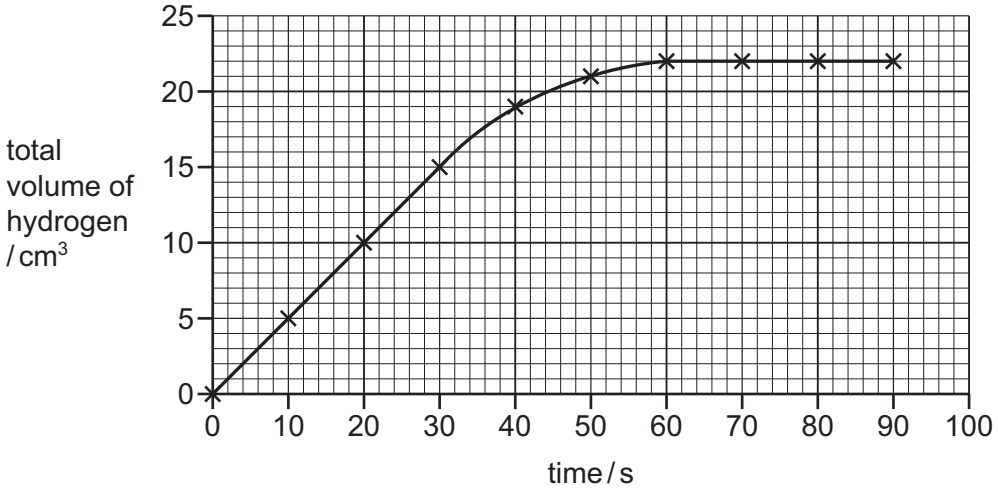
| | volume of water added / $cm^3$ | temperature / °C |
|---|---|---|
| **A** | 10 | 30 |
| **B** | 10 | 50 |
| **C** | 40 | 30 |
| **D** | 40 | 50 |

© UCLES 2024

**15** The rate of reaction between magnesium and hydrochloric acid is investigated.

The total volume of hydrogen given off is measured at different times.

A graph of the results is shown.




Which conclusions are correct?

1 The rate is fastest between 0 and 30 seconds.

2 The maximum volume of hydrogen given off is 22 $cm^3$.

3 At 40 seconds, 20 $cm^3$ of hydrogen is given off.

**A** 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

**16** Water is added to anhydrous copper(II) sulfate.

Which row describes the direction of energy change and the colour change of the mixture during the reaction?

| | direction of energy change | colour change |
|---|---|---|
| **A** | absorbed from the surroundings | blue to white |
| **B** | absorbed from the surroundings | white to blue |
| **C** | released to the surroundings | blue to white |
| **D** | released to the surroundings | white to blue |

© UCLES 2024

**17** Which equation represents an oxidation reaction?

**A** $CaCO_3 \rightarrow CaO + CO_2$

**B** $4FeO + O_2 \rightarrow 2Fe_2O_3$

**C** $2NO_2 \rightarrow N_2O_4$

**D** $2P_2O_5 \rightarrow P_4O_{10}$

**18** A farmer treats a field with calcium hydroxide to make it less acidic.

When the farmer adds ammonium nitrate fertiliser to the field immediately after the calcium hydroxide, the two substances react.

Why does this reaction make the fertiliser less effective?

**A** It makes ammonia gas, so less nitrogen is absorbed by the soil.

**B** It makes an acid, making the soil acidic again.

**C** It makes nitrogen gas, so less nitrogen is absorbed by the soil.

**D** It makes the fertiliser too strong, stopping the plants growing well.

**19** Which statement about sodium oxide or nitrogen dioxide is correct?

**A** Nitrogen dioxide is a solid at room temperature.

**B** Nitrogen dioxide is acidic.

**C** Sodium oxide has a lower melting point than nitrogen dioxide.

**D** Sodium oxide is covalently bonded.

**20** A titration method is used to prepare a pure soluble sulfate salt from dilute sulfuric acid.

What is the other reagent?

**A** copper(II) oxide

**B** magnesium

**C** sodium hydroxide

**D** zinc carbonate

© UCLES 2024

**21** Which row about elements in the Periodic Table is correct?

| | statement 1 | statement 2 |
|---|---|---|
| **A** | two elements in the same group have similar chemical properties | metals are on the left of the table |
| **B** | two elements in the same group have similar chemical properties | metals are on the right of the table |
| **C** | two elements in the same period have similar chemical properties | metals are on the left of the table |
| **D** | two elements in the same period have similar chemical properties | metals are on the right of the table |

**22** The table gives some information about three elements in Group I of the Periodic Table.

| element | atomic number | melting point in °C | density in g / cm$^3$ |
|---|---|---|---|
| lithium | 3 | 181 | 0.53 |
| sodium | 11 | 98 | 0.97 |
| rubidium | 37 | X | X |

Which row identifies the melting point and the density of rubidium?

| | melting point in °C | density in g / cm$^3$ |
|---|---|---|
| **A** | 39 | 0.38 |
| **B** | 39 | 1.53 |
| **C** | 253 | 0.38 |
| **D** | 253 | 1.53 |

**23** Which statement describes a transition element?

**A** It is a dull grey metal that only forms white compounds.

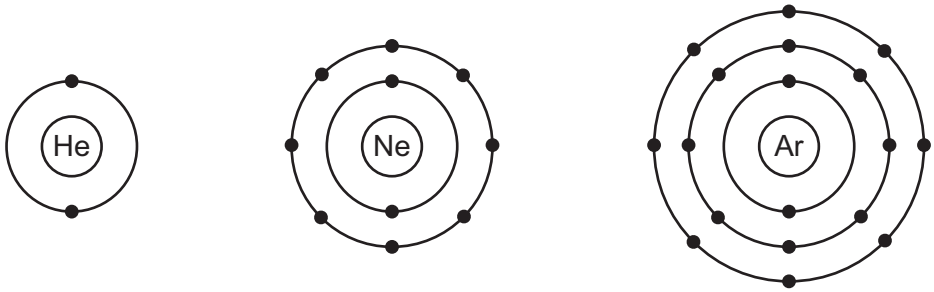
**B** It is a high-density metal with a high melting point that is used as a catalyst.

**C** It is a low-density metal with a high melting point that reacts with steam to make hydrogen.

**D** It is a soft, shiny silver metal that reacts vigorously with water.

© UCLES 2024

**24** The electronic configurations of helium, neon and argon are shown.




Which row describes these gases?

| | reactivity | form of the gas | electronic configuration |
|---|---|---|---|
| **A** | reactive | monatomic | incomplete outer shell of electrons |
| **B** | unreactive | diatomic | complete outer shell of electrons |
| **C** | unreactive | diatomic | incomplete outer shell of electrons |
| **D** | unreactive | monatomic | complete outer shell of electrons |

**25** X is a shiny silver-coloured solid at room temperature and pressure.

X is a good conductor of heat and electricity when solid.

Which statement about X is correct?

**A** X is an ionic compound or a metallic element.

**B** X is a metallic element or a non-metallic element.

**C** X is an alloy or a metallic element.

**D** X is an alloy or a non-metallic element.

**26** Which elements can be combined to produce an alloy?

1 magnesium and aluminium

2 nitrogen and oxygen

3 iron and carbon

4 copper and zinc

**A** 1, 3 and 4 **B** 1 and 2 **C** 2 and 3 **D** 4 only

© UCLES 2024

**27** Three metals, L, M and N, are added separately to dilute hydrochloric acid and cold water.

The results are shown.

| metal | reaction with dilute hydrochloric acid | reaction with cold water |
|---|---|---|
| L | hydrogen forms | no reaction |
| M | hydrogen forms | hydrogen forms |
| N | no reaction | no reaction |

What is the order of reactivity of the metals?

| | least reactive → | | most reactive |
|---|---|---|---|
| **A** | L | N | M |
| **B** | M | L | N |
| **C** | N | L | M |
| **D** | N | M | L |

**28** Which reaction produces carbon dioxide?

**A** cracking of large hydrocarbon molecules

**B** photosynthesis

**C** reaction of a base with a carbonate

**D** thermal decomposition of calcium carbonate

© UCLES 2024

[Turn over

**29** A sample of air containing four gases only is analysed.

99.0% of the sample contains the two main gases in the same percentages as in clean, dry air.

The remaining 1.0% of the sample contains argon and carbon dioxide.

The gas that makes up 0.1% of the sample turns limewater milky.

Which row shows the percentage composition of the sample of air?

| | 99.0% of the sample | 0.9% of the sample | 0.1% of the sample |
|---|---|---|---|
| **A** | 78.0% nitrogen, 21.0% oxygen | argon | carbon dioxide |
| **B** | 78.0% nitrogen, 21.0% oxygen | carbon dioxide | argon |
| **C** | 78.0% oxygen, 21.0% nitrogen | argon | carbon dioxide |
| **D** | 78.0% oxygen, 21.0% nitrogen | carbon dioxide | argon |

**30** Which substance contains **two** elements that are found in NPK fertilisers?

**A** ammonium chloride

**B** calcium hydroxide

**C** potassium nitrate

**D** sodium phosphate

**31** Which statement about sulfur is correct?

**A** When sulfur is burned, it produces a substance that causes acid rain.

**B** Sulfur is produced by the thermal decomposition of limestone.

**C** Compounds of sulfur make up approximately 1% of unpolluted air.

**D** Sulfur is a member of the family of elements called halogens.

**32** What are **two** adverse effects of particulates in the air?

1 acid rain

2 cancer

3 photochemical smog

4 respiratory problems

**A** 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

© UCLES 2024

**33** Which formula represents a compound that is a member of the homologous series of alkanes?

**A** $C_2H_4$ **B** $C_3H_6$ **C** $C_4H_8$ **D** $C_5H_{12}$

**34** Which statement about ethane is correct?

**A** It rapidly decolourises aqueous bromine.

**B** It does **not** burn.

**C** It forms long-chain compounds called polymers.

**D** It only contains single bonds between its atoms.

**35** Which raw material is used to make ethanol by fermentation?

**A** carbon dioxide

**B** ethene

**C** glucose

**D** natural gas

**36** Which statement about ethanoic acid is correct?

**A** It contains a –COOH group.

**B** It has a pH greater than pH 7.

**C** It reacts with sodium carbonate to form hydrogen gas.

**D** It reacts with copper to form copper(II) ethanoate.

**37** Which statement explains why the disposal of plastic waste leads to environmental problems?

**A** Plastic waste forms toxic gases when it is burned.

**B** Plastic waste contains many small molecules.

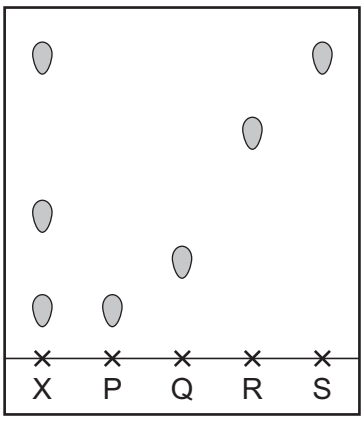
**C** Plastic waste rapidly dissolves in the oceans.

**D** Plastic waste reacts with both acids and bases.

© UCLES 2024

**38** Substance X and four known substances, P, Q, R and S, are analysed by chromatography.

The chromatogram produced is shown.




Which statement about X is correct?

**A** It is a mixture of P, Q and S.

**B** It contains P and S only.

**C** It contains P, S and another unknown substance.

**D** It is a mixture of Q, R and S.

**39** Copper is insoluble in water.

Copper(II) oxide is a solid that is insoluble in water but reacts with dilute hydrochloric acid.

Which method is used to separate copper from a mixture of copper and copper(II) oxide?

**A** dissolve the mixture in water then filter

**B** dissolve the mixture in water then crystallise

**C** react the mixture with dilute hydrochloric acid then filter

**D** react the mixture with dilute hydrochloric acid then crystallise

© UCLES 2024

**40** A salt, S, is dissolved in water and three tests are carried out on the solution formed.

| | test | result |
|---|---|---|
| 1 | aqueous sodium hydroxide is added | green precipitate forms, insoluble in excess sodium hydroxide |
| 2 | dilute nitric acid is added | no reaction |
| 3 | aqueous barium nitrate is added to the solution from test 2 | white precipitate forms |

What is the identity of S?

**A** copper(II) chloride

**B** copper(II) sulfate

**C** iron(II) chloride

**D** iron(II) sulfate

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.

© UCLES 2024

© UCLES 2024





## The Periodic Table of Elements

| Group | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | II | | | | | | | | | | | III | IV | V | VI | VII | VIII |
| | | | | | | | 1 H hydrogen 1 | | | | | | | | | | 2 He helium 4 |
| 3 Li lithium 7 | 4 Be beryllium 9 | | | | | | | | | | | 5 B boron 11 | 6 C carbon 12 | 7 N nitrogen 14 | 8 O oxygen 16 | 9 F fluorine 19 | 10 Ne neon 20 |
| 11 Na sodium 23 | 12 Mg magnesium 24 | | | | | | | | | | | 13 Al aluminium 27 | 14 Si silicon 28 | 15 P phosphorus 31 | 16 S sulfur 32 | 17 Cl chlorine 35.5 | 18 Ar argon 40 |
| 19 K potassium 39 | 20 Ca calcium 40 | 21 Sc scandium 45 | 22 Ti titanium 48 | 23 V vanadium 51 | 24 Cr chromium 52 | 25 Mn manganese 55 | 26 Fe iron 56 | 27 Co cobalt 59 | 28 Ni nickel 59 | 29 Cu copper 64 | 30 Zn zinc 65 | 31 Ga gallium 70 | 32 Ge germanium 73 | 33 As arsenic 75 | 34 Se selenium 79 | 35 Br bromine 80 | 36 Kr krypton 84 |
| 37 Rb rubidium 85 | 38 Sr strontium 88 | 39 Y yttrium 89 | 40 Zr zirconium 91 | 41 Nb niobium 93 | 42 Mo molybdenum 96 | 43 Tc technetium – | 44 Ru ruthenium 101 | 45 Rh rhodium 103 | 46 Pd palladium 106 | 47 Ag silver 108 | 48 Cd cadmium 112 | 49 In indium 115 | 50 Sn tin 119 | 51 Sb antimony 122 | 52 Te tellurium 128 | 53 I iodine 127 | 54 Xe xenon 131 |
| 55 Cs caesium 133 | 56 Ba barium 137 | 57–71 lanthanoids | 72 Hf hafnium 178 | 73 Ta tantalum 181 | 74 W tungsten 184 | 75 Re rhenium 186 | 76 Os osmium 190 | 77 Ir iridium 192 | 78 Pt platinum 195 | 79 Au gold 197 | 80 Hg mercury 201 | 81 Tl thallium 204 | 82 Pb lead 207 | 83 Bi bismuth 209 | 84 Po polonium – | 85 At astatine – | 86 Rn radon – |
| 87 Fr francium – | 88 Ra radium – | 89–103 actinoids | 104 Rf rutherfordium – | 105 Db dubnium – | 106 Sg seaborgium – | 107 Bh bohrium – | 108 Hs hassium – | 109 Mt meitnerium – | 110 Ds darmstadtium – | 111 Rg roentgenium – | 112 Cn copernicium – | 113 Nh nihonium – | 114 Fl flerovium – | 115 Mc moscovium – | 116 Lv livermorium – | 117 Ts tennessine – | 118 Og oganesson – |

**Key**

atomic number
atomic symbol
name
relative atomic mass

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| lanthanoids | 57 La lanthanum 139 | 58 Ce cerium 140 | 59 Pr praseodymium 141 | 60 Nd neodymium 144 | 61 Pm promethium – | 62 Sm samarium 150 | 63 Eu europium 152 | 64 Gd gadolinium 157 | 65 Tb terbium 159 | 66 Dy dysprosium 163 | 67 Ho holmium 165 | 68 Er erbium 167 | 69 Tm thulium 169 | 70 Yb ytterbium 173 | 71 Lu lutetium 175 |
| actinoids | 89 Ac actinium – | 90 Th thorium 232 | 91 Pa protactinium 231 | 92 U uranium 238 | 93 Np neptunium – | 94 Pu plutonium – | 95 Am americium – | 96 Cm curium – | 97 Bk berkelium – | 98 Cf californium – | 99 Es einsteinium – | 100 Fm fermium – | 101 Md mendelevium – | 102 No nobelium – | 103 Lr lawrencium – |

The volume of one mole of any gas is 24 $dm^3$ at room temperature and pressure (r.t.p.).